

REMARKS

Claims 53-59, 67-68, 71-72 and 79-81 were pending in the application. In the Office Action dated January 19, 2006, claims 53-59, 67-68, 71-72 and 79-81 were rejected. In the instant Amendment, claims 53, 67, 71 and 79-81 have been amended to clarify the invention. The amendments are proper in that they place the claims in condition for allowance or in better form for appeal. Upon entry of the above-made amendments, claims 53-59, 67-68, 71-72 and 79-81 will be pending.

Claims 53, 67, 71 and 79-81 have been amended such that the claims recite the methods carried out by the computer systems in a step-by-step manner. Claims 79-81 have also been amended to delete the phrase “for use in conjunction with a computer having a processor and a memory connected to the processor” in the preamble. Claims 53, 67, 71 and 79-81 have also been amended such that the claims have appropriate antecedent basis. These amendments are made to make the claim language clearer.

Claims 53, 67, 71 and 79-81 have also been amended to recite that step (i) involves *receiving* perturbation response profiles (emphasis added). Support for the amendment can be found in the specification at page 10, lines 11-12; and page 37, lines 26-32.

Claims 53, 67, 71 and 79-81 have also been amended to clarify that each said perturbation response profile comprises measurements of a plurality of cellular constituents in a *first* cell of said cell type, and the diagnostic profile comprising measurements of a plurality of cellular constituents in a *second* cell of said cell type (emphasis added). Support for the amendment can be found in the specification at page 27, lines 5-10; page 28, lines 3-8. These passages clearly disclose that the perturbation response profile and the diagnostic profile are measured in different cells.

Claims 53, 67, 71 and 79-81 have also been amended to clarify that step (ii) involves interpolating measurements of each cellular constituent of said plurality in said perturbation response profiles over said plurality of discrete levels of said perturbation to obtain a perturbation response curve of *measurements of* said cellular constituent *as a function of level of said perturbation* to said cellular constituent of interest so that an interpolated perturbation response profile comprising measurements of said plurality of cellular constituents may be extracted at *any* level over a range of levels of perturbation (emphasis added). Support for the amendment can be found in the specification at page 28, lines 19-28.

Claim 67 has also been amended to recite in step (iii) “each said interpolated perturbation response profile comprising measurements of said plurality of cellular constituents extracted for said determined level *of perturbation to a protein in said plurality of proteins* from said perturbation response curves” (emphasis added). Support for the amendment can be found in the specification at page 7, lines 5-12.

No new matter has been added by these amendments. Entry of the foregoing amendments and consideration of the following remarks are respectfully requested.

APPLICANTS’ INTERVIEW SUMMARY

Applicant thanks Examiner Anna Skibinsky and Supervisory Examiner Ardin Marschel for the courtesies extended during the telephonic interview on April 19, 2006 (hereinafter “the Interview”) with Ms. Adriane M. Antler, Mr. R. Douglas Bradley, Ms. Eileen Sun, and Mr. Weining Wang. During the interview, proposed claim amendments (as are set forth in the instant Amendment) and the §101 rejection were discussed. The support for the claim amendments was discussed, and Examiner Skibinsky agreed that the amendments were supported by the specification. Ms. Antler then explained the case law supporting Applicants’ position that the claims were directed to statutory subject matter. Examiner Skibinsky suggested that Applicants amend the claims by replacing the term “measurements” with the term “measuring” to introduce a physical step. Ms. Antler pointed out that the case law was clear that no physical step is required to constitute statutory subject matter. Ms. Antler also pointed out that the claims are directed to computer systems and computer program products, which manipulate data (or cause a computer to manipulate data) representing measurements, and which do not themselves perform a step of measuring. Supervisory Examiner Marschel agreed with the points made by Ms. Antler. Supervisory Examiner Marschel also stated that, in response to filing of the amendments and remarks, the Patent and Trademark Office most likely would withdraw the outstanding rejections.

THE REJECTION UNDER 35 U.S.C. § 101 SHOULD BE WITHDRAWN

Claims 53-59, 67, 68, 71, 72 and 79-81 are rejected under 35 U.S.C. § 101 as allegedly directed to non-statutory subject matter. The Examiner contends that a tangible, concrete and useful result must be disclosed in the claims and not in Applicants’ arguments. The Examiner also contends that the claims lack a tangible, concrete and useful result because the purpose for the calculation of protein activity is unclear due to the verbose nature

of the claims. The Examiner further contends that the tangible, concrete and useful result is unspecified in the intertwined body of the method steps as well as the verbose preamble.

Applicants respectfully point out that whether a claim is directed to statutory subject matter is determined by the significance of the result produced by the claimed process or product, i.e., whether the result has specific meaning and is not merely a mathematical abstraction. Applicants respectfully direct the attention of the Examiner to the applicable case law. In *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, the Federal Circuit held that

... the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, *because it produces "a useful, concrete and tangible result" -- a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.*

State Street Bank & Trust Co. v. Signature Financial Group Inc., 47 U.S.P.Q.2d 1596, 1601 (Fed. Cir. 1998) (emphasis added). In *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, which claims a method and apparatus for analyzing electrocardiograph signals to determine the presence or absence of a predetermined level of high-frequency energy in the late QRS signal, the court held that manipulation of numbers representing electrocardiograph signals related to the patient's heart function to generate *a numerical value which indicates whether the patient is at high risk for ventricular tachycardia corresponded to a useful, concrete or tangible thing -- the condition of a patient's heart.* *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, 22 U.S.P.Q.2d 1033, 1037-38 (Fed. Cir. 1992). The court has also held that the requirement of "useful, concrete, and tangible result" is a requirement that the numerical result has specific meaning and is not a mathematical abstraction:

Arrhythmia's method claims satisfied Section 101 because the mathematical algorithm included within the process was applied to produce *a number which had specific meaning -- a useful, concrete, tangible result -- not a mathematical abstraction.* [citation omitted]

AT & T Corp. v. Excel Communication Inc. 50 U.S.P.Q.2d 1447, 1452 (Fed Cir. 1999) (emphasis added).

In the present case, the rejected claims are directed to computer systems or computer program products for determining a level of protein activity or a level of activity of a biologically active cellular constituent of interest in a cell of a cell type. The computer systems transform data of measurements of cellular constituents and determine a numerical value representing a level of protein activity (or activity of a biologically active cellular constituent of interest), e.g., determining a level of perturbation to said protein (or said biologically active cellular constituent of interest) ... wherein said determined level of perturbation to said protein (or said biologically active cellular constituent of interest) represents said protein activity level (or level of activity of said biologically active cellular constituent of interest) in said cell type. Both the measurements of cellular constituents in a cell and the activity of a protein (or biologically active cellular constituent of interest) in a cell represent physical/biological aspects of cells. The determined level of activity of a protein (or biologically active cellular constituent of interest) in a cell type has important technological as well as commercial uses (see, e.g., the background section of the specification, especially the disclosure at page 2, line 18 through page 3, line 24). Thus, the level of activity of a protein (or biologically active cellular constituent of interest) determined by the computer system *is* a tangible, concrete and useful result, like a final share price and a numerical value indicating whether a patient is at high risk for ventricular tachycardia. In order to clarify the claim language, Applicants have amended the claims to recite the method that is carried out by the computer in a step-by-step manner such that it is clear that the claimed computer determines the level of activity of a protein (or a biologically active cellular constituent of interest).

The Examiner also contends that claims 53-59, 67, 68, 71, 72 and 79-81 are deemed non-statutory because the claims are set forth as a manipulation of numbers in “computer space,” and there is no physical manipulation of the invention or a visual display or a hard drive that renders the invention as something manifesting in physical space. The Examiner also contends that “[t]he recitation of a computer program product, processor and memory does not qualify as statutory subject matter because said entities are not necessarily physical subjects accessible by a user.”

Applicants first respectfully submit that it is unclear what the Examiner intends to mean by stating that a computer program product, processor and memory are not physical subjects that are necessarily accessible by a user. Applicants respectfully submit that both a

computer system and a computer program product, as a machine or an article of manufacture, are necessarily physical objects accessible by a user.

Applicants next respectfully point out that whether a claimed computer system is deemed “manipulation of numbers” is not determinant of whether the claim is statutory under section 101. The proper inquiry is what the numbers represent: are the numbers representing something having specific meaning in the real world or mere mathematical abstractions. As discussed above, both the measurements of cellular constituents in a cell and the activity of a protein (or biologically active cellular constituent of interest) in a cell are not mathematical abstractions, but represent physical/biological aspects of the cell or the protein. The claimed steps of “determining a level of perturbation” and/or “interpolating” transform numbers representing measurements of cellular constituents in a cell and determine a number representing the activity of a protein (or biologically active cellular constituent of interest) in a cell of a cell type, which has important technological as well as commercial uses. Thus, regardless of whether the Examiner is correct in contending that the rejected claims are set forth as a manipulation of numbers in “computer space,” and that there is no physical manipulation of the invention or a visual display or a hard drive that renders the invention as something manifesting in physical space, the computer systems and computer program products as claimed in the rejected claims, without more, are statutory.

The fact that the claimed computer systems manipulate numbers in “computer space” does not automatically render the claims non-statutory. Applicants assume that the phrase “in ‘computer space’” means “inside the computer.” In *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, the court held that

[i]t is of course true that a modern digital computer manipulates data, usually in binary form, by performing mathematical operations, such as addition, subtraction, multiplication, division, or bit shifting, on the data. But this is only *how* the computer does what it does. Of importance is the significance of the data and their manipulation in the real world, i.e., *what* the computer is doing.

Arrhythmia Research Technology Inc. v. Corazonix Corp., 22 U.S.P.Q.2d 1033, 1036 (Fed. Cir. 1992) (emphasis in the original). After determining that the data of *Arrhythmia* represent physical signals, the *Arrhythmia* court went on to hold that

[t]hese claimed steps of “converting”, “applying”, “determining”, and “comparing” are physical process steps that transform one physical, electrical signal into another. [T]he steps of Simson's claimed method comprise an otherwise statutory process

whose mathematical procedures are applied to physical process steps.

Arrhythmia Research Technology Inc. v. Corazonix Corp., 22 U.S.P.Q.2d 1033, 1038 (Fed. Cir. 1992).

The *Arrhythmia* court disapproved the view that manipulation of “signals” in a computer is non-statutory because “there is nothing necessarily physical about ‘signals.’” *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, 22 U.S.P.Q.2d 1033, 1038 (Fed. Cir. 1992). The *Arrhythmia* court relied on *In Re Taner* 681 F.2d 787 (C.C.P.A. 1982), which concerns claims directed to a method of conversion of seismic signals into a different form. In *In Re Taner*, the Court of Customs and Patent Appeals held that the Patent and Trademark Office Board of Appeals (“Board”) was incorrect in holding non-statutory claims directed to a method of conversion of seismic signals into a different form, with the Board relying on the reason that “there is nothing necessarily physical about ‘signals’” and that “the end product of (appellants’ invention) is a mathematical result in the form of a pure number.” *In Re Taner* 681 F.2d 787, 790 (C.C.P.A. 1982). The *Taner* court held that seismic signals are physical things and that claims reciting a mathematical algorithm for manipulating them are drawn to “a process of converting one physical thing into another physical thing.” *In Re Taner* 681 F.2d 787, 790 (C.C.P.A. 1982).

Thus, the case law is clear that a claimed process or product that manipulates numbers in “computer space” are statutory if the numbers represent physical signals because such a process or product converts “one physical thing into another physical thing.”

Moreover, contrary to the Examiner’s contention, the law does not require additional “physical manipulation of the invention” or manifestation “in physical space.” In *AT & T Corp. v. Excel Communication Inc.* 50 U.S.P.Q.2d 1447 (Fed Cir. 1999), the court explicitly addressed this issue, and held that

[t]he notion of “physical transformation” ... is *not an invariable requirement*, but merely one example of how a mathematical algorithm may bring about a useful application.

AT & T Corp. v. Excel Communication Inc. 50 U.S.P.Q.2d 1447, 1452 (Fed Cir. 1999) (emphasis added).

The Examiner’s contention that statutory subject matter requires hardware such as a visual display or a hard drive is also inconsistent with the case law. For example, the

apparatus claim of *Arrhythmia* (see, claim 7, *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, 22 U.S.P.Q.2d at 1035), which claims an apparatus for determining a number indicating whether a patient is at high risk for ventricular tachycardia, was held statutory even though it recites neither a visual display nor a hard drive for displaying or storing the determined number. Therefore, the case law is clear that to constitute statutory subject matter, neither a display nor a hard drive is required.

Applicants also respectfully point out that the determined activity levels may be used in various different ways, including but not limited to uses in which they are provided to a user via a display or a hard disk. For example, they can be provided to other programs and/or apparatuses without being displayed on a monitor or being stored on a hard drive. As discussed above, the determined activity levels represent something having specific meaning in the real world and are not merely mathematical abstractions, i.e., they constitute concrete, tangible and useful results. Thus, the claims are statutory regardless of whether the results produced by the claimed computer systems are provided to a user directly via a display or a hard disk or are used in some other manner.

With respect to claims 79-81, the Examiner contends that the phrase “for use in conjunction with a computer having a processor and a memory connected to the processor” is an intended use and not a positive limitation. The Examiner suggests that Applicants delete the phrase. In order to expedite prosecution, Applicants have amended the claims according to the Examiner’s suggestion.

Applicants respectfully submit that the rejection of claims 53-59, 67, 68, 71, 72 and 79-81 under 35 U.S.C. § 101 therefore should be withdrawn.


CONCLUSION

Applicants respectfully request entry of the foregoing amendments and remarks into the file of the above-identified application. Applicants believe that all the pending claims are

in condition for allowance. Withdrawal of the Examiner's rejections and allowance of the application are respectfully requested.

Respectfully submitted,

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